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Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/806,871	Applicant(s) DIMPSEY ET AL.	
	Examiner Arpan P. Savla	Art Unit 2185	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>See Continuation Sheet</u> . | 6) <input type="checkbox"/> Other: _____  |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :6/30/05, 3/27/06, 4/25/06, 5/31/06, 8/29/06.

### **DETAILED ACTION**

The instant application having Application No. 10/806,871 has a total of 24 claims pending in the application, there are 4 independent claims and 21 dependent claims, all of which are ready for examination by the Examiner.

### **INFORMATION CONCERNING OATH/DECLARATION**

#### **Oath/Declaration**

1. Applicant's oath/declaration has been reviewed by Examiner and is found to conform to the requirements prescribed in 37 CFR 1.63.

### **INFORMATION CONCERNING DRAWINGS**

#### **Drawings**

2. Applicant's drawings submitted March 22, 2004 are acceptable for examination purposes.

### **ACKNOWLEDGMENT OF REFERENCES CITED BY APPLICANT**

#### **Information Disclosure Statement**

3. As required by MPEP § 609(c), Applicant's submission of the Information Disclosure Statements dated June 30, 2005, March 27, 2006, April 25, 2006, May 31, 2006, and August 29, 2006 are acknowledged by Examiner and cited references have been considered in the examination of the claims now pending. As required by MPEP §

609 c(2), a copy of the PTOL-1449 initialed and dated by Examiner is attached to the instant office action.

4. Reference BJ on the Information Disclosure Statement dated June 30, 2005 has **not** been considered by Examiner because the reference does not comply with 37 CFR 1.98 (a)(3)(ii). Reference BJ is a non-English-language document, however, there is no copy of an English-language translation of the document, or portion thereof.

5. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

## **OBJECTIONS**

### **Specification**

6. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Method And Apparatus For Hardware Assistance For Prefetching A Pointer To A Data Structure Identified By A Prefetch Indicator."

**REJECTIONS NOT BASED ON PRIOR ART****Double Patenting**

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. **Claims 1, 3-6, 8, 11, 13-15, 18, and 20-22** are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over **claims 1-3, 6-7, 9, 12-14, 17-20, and 23** of copending Application No. 10/806,866.

Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 1, 3-6, 8, 11, 13-15, 18, and 20-22 of the instant application are an obvious modification of claims 1-3, 6-7, 9, 12-14, 17-20, and 23 of copending application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claims 1, 3-6, 8, 11, 13-15, 18, and 20-22 of the instant application are compared to claims 1-3, 6-7, 9, 12-14, 17-20, and 23 of the co-pending application below:

<u><b>Instant Application 10/806,871</b></u>	<u><b>Co-pending Application 10/806,866</b></u>
1. A method in a data processing system for providing hardware assistance to prefetch data during execution of code by a processor in the data processing system, the method comprising: responsive to loading an instruction in the code into a cache, determining, by a processor unit, whether a <b>prefetch indicator is associated with the instruction</b> ; and responsive to the <b>prefetch indicator being associated with the instruction</b> , selectively prefetching a <b>pointer to a data structure identified by the prefetch indicator</b> into the cache in the processor.	1. A method in a data processing system for providing hardware assistance to prefetch data during execution of code by a process or in the data processing system, the method comprising: responsive to loading of an instruction in the code into a cache, determining, by a processor unit, whether <b>metadata for a prefetch is present for the instruction</b> ; and responsive to <b>metadata being present for the instruction</b> , selectively prefetching <b>data, from within a data structure using the metadata</b> , into the cache in a processor.
3. The method of claim 1, wherein the selectively prefetching step <b>includes</b> : determining whether outstanding cache misses are present; and prefetching the	2. The method of claim 1, wherein the selectively prefetching step <b>comprises</b> : determining whether outstanding cache misses are present; and prefetching the

data if a number of outstanding cache misses are less than a threshold.	data if a number of outstanding cache misses are less than a threshold.
4. The method of claim 1, wherein the selectively prefetching step includes: determining whether to replace cache lines; and prefetching the data if a number of cache lines chosen to be replaced are greater than a threshold.	3. The method of claim 1, wherein the selectively prefetching step includes: determining whether to replace cache lines; and prefetching the data if a number of cache lines chosen to be replaced are greater than a threshold.
5. The method of claim 1, wherein the processor unit is selected from one of an instruction cache, <b>data cache</b> , or a load/store unit.	6. The method of claim 1, wherein the processor unit is selected from one of an instruction cache or a load/store unit.
6. The method of claim 1, wherein the cache is an instruction cache.	7. The method of claim 1, wherein the cache is an instruction cache.
8. A data processing system comprising: a cache in a processor in the data processing system; and a load/store unit in the processor, wherein the load/store unit determines whether a <b>prefetch indicator is associated with an instruction</b> in response to loading the instruction for execution into the cache, the load/store	9. A data processing system comprising: a cache in a processor in the data processing system; and a load/store unit in the processor, wherein the load/store unit determines <b>whether metadata for a prefetch is present</b> in response to loading an instruction for execution into a cache, the load/store unit selectively prefetches



<p>unit selectively prefetches a <b>pointer to a data structure identified by the prefetch indicator</b> into the cache using metadata associated with the instruction.</p>	<p><b>data from within a data structure</b> into the cache using the metadata associated with the instruction.</p>
<p>11. A data processing system for providing hardware assistance to prefetch data during execution of code by a process or in the data processing system, the data processing system comprising: determining means, responsive to loading an instruction in the code into a cache, for determining, by the a processor unit, whether a <b>prefetch indicator is associated with the instruction</b>; and selectively prefetching means, responsive to the <b>prefetch indicator being associated with the instruction</b>, for selectively prefetching a <b>pointer to a data structure identified by the prefetch indicator</b> into the cache in the processor.</p>	<p>12. A data processing system for providing hardware assistance to prefetch data during execution of code by a process or in the data processing system, the data processing system comprising: determining means, responsive to loading of an instruction in the code into a cache, for determining, by a processor unit, <b>whether metadata for a prefetch is present for the instruction</b>; and selectively prefetching means, responsive to <b>metadata being present for the instruction</b>, for selectively prefetching <b>data, from within a data structure using the metadata</b>, into the cache in a processor.</p>
<p>13. The data processing system of claim 11, wherein the selectively prefetching</p>	<p>13. The data processing system of claim 12, wherein the selectively prefetching</p>

means <b>includes</b> : means for determining whether outstanding cache misses are present; and means for prefetching the data if a number of outstanding cache misses are less than a threshold.	means <b>comprises</b> : <b>first</b> means for determining whether outstanding cache misses are present; and <b>second</b> means for prefetching the data if a number of outstanding cache misses are less than a threshold.
14. The data processing system of claim 11, wherein the selectively prefetching means includes: means for determining whether to replace cache lines; and means for prefetching the data if a number of cache lines chosen to be replaced are greater than a threshold.	14. The data processing system of claim 12, wherein the selectively prefetching means includes: <b>first</b> means for determining whether to replace cache lines; and <b>second</b> means for prefetching the data if a number of cache lines chosen to be replaced are greater than a threshold.
15. The data processing system of claim 11, wherein the processor unit is selected from one of an instruction cache, a <b>data cache</b> , or a load/store unit.	17. The data processing system of claim 12, wherein the processor unit is selected from one of an instruction cache or a load/store unit.
18. A computer program product in a computer readable medium for providing hardware assistance to prefetch data during execution of code by a process or	18. A computer program product in a computer readable medium for providing hardware assistance to prefetch data during execution of code by a process or

<p>in the data processing system, the computer program product comprising: first instructions, responsive to loading an instruction in the code into a cache, for determining, by the a processor unit, whether a <b>prefetch indicator is associated with</b> the instruction; and second instructions, responsive to the <b>prefetch indicator being associated with</b> the instruction, for selectively prefetching a <b>pointer to a data structure identified by the prefetch indicator</b> into the cache in the processor.</p>	<p>in the data processing system, the computer program product comprising: first instructions, responsive to loading of an instruction in the code into a cache, for determining, by a processor unit, whether <b>metadata for a prefetch is present for</b> the instruction; and second instructions, responsive to <b>metadata being present for</b> the instruction, for selectively prefetching <b>data, from within a data structure using the metadata</b>, into the cache in a processor.</p>
<p>20. The computer program product of claim 18, wherein the second instructions <b>includes:</b> first sub-instructions for determining whether outstanding cache misses are present; and second sub-instructions for prefetching the data if a number of outstanding cache misses are less than a threshold.</p>	<p>19. The computer program product of claim 18, wherein the second instructions <b>comprises:</b> first sub-instructions for determining whether outstanding cache misses are present; and second sub-instructions for prefetching the data if a number of outstanding cache misses are less than a threshold.</p>
<p>21. The computer program product of</p>	<p>20. The computer program product of</p>

claim 18, wherein the second instructions includes: first sub-instructions for determining whether to replace cache lines; and second sub-instructions for prefetching the data if a number of cache lines chosen to be replaced are greater than a threshold.	claim 18, wherein the second instructions includes: first sub-instructions for determining whether to replace cache lines; and second sub-instructions for prefetching the data if a number of cache lines chosen to be replaced are greater than a threshold.
22. The computer program product of claim 18, wherein the processor unit is selected from one of an instruction cache, <b>a data cache</b> , or a load/store unit.	23. The computer program product of claim 18, wherein the processor unit is selected from one of an instruction cache or a load/store unit.

8. **As per claims 1, 8, 11, and 18** in the instant application and **claims 1, 9, 12, and 18** in co-pending application 10/806,866, one difference between the claims are whether a prefetch indicator is associated with the instruction as opposed to whether metadata is present for the instruction.

However, as is well known in the art, a prefetch indicator can be a type of metadata.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to implement metadata as a prefetch indicator.

The motivation for doing so would have been to improve performance due to memory access prediction.

Another difference between the claims is prefetching a pointer to a data structure identified by the prefetch indicator as opposed to prefetching data from within a data structure using the metadata.

However, as is well known in the art, a pointer to a data structure can be a type of data.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to implement data as a pointer to a data structure.

The motivation for doing so would have been to improve performance due to reducing the time spent waiting for memory accesses to complete by pointing to a data location that is likely to be referenced.

Therefore, it would have been obvious to implement the metadata and data of claims 1, 9, 12, and 18 in co-pending application 10/806,866 as the prefetch indicator and pointer to a data structure respectively of claims 1, 8, 11, and 18 in the instant application.

**Claim Rejections - 35 USC § 101**

9. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

10. **Claims 18-24 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.** Claims 18-24 are not limited to tangible embodiments. In view of Applicant's disclosure, pg. 59, paragraph 1, the computer readable medium is not limited to tangible embodiments, instead being define

as including both tangible embodiments (e.g. recordable-type media, such as a floppy disk, hard disk drive, a RAM, CD-ROMS, and DVD-ROMS) and intangible embodiments (e.g. transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions). As such, claims 18-24 are not limited to statutory subject matter and are therefore non-statutory.

## **REJECTIONS BASED ON PRIOR ART**

### **Claim Rejections - 35 USC § 103**

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. **Claims 1-2, 5, 7-12, 15, 17-19, 22, and 24 are rejected under 35 U.S.C. 103(a) as being obvious over Matsubara (U.S. Patent 6,381,679) in view of Anonymously Disclosed, "Method for the dynamic prediction of nonsequential memory accesses", hereafter "Anon."**

13. **As per claims 1 and 18**, Matsubara discloses a method in a data processing system for providing hardware assistance to prefetch data during execution of code by a processor in the data processing system, the method comprising:

responsive to loading an instruction in the code into a cache, determining, by a processor unit, whether a prefetch indicator is associated with the instruction (col. 5,

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lines 1-10; col. 6, lines 35-42; col. 7, lines 10-20; Fig. 1; Fig. 2, elements 21 and 22). *It should be noted that computer program product in claims 18-24 executes the exact same functions as the methods in claims 1-7. Therefore, any references that teach claims 1-7 also teach the corresponding claims 18-24. It should also be noted that the "indication bits (i.e. PF bits)" are analogous to the "prefetch indicator" and the "CPU 21" is analogous to the "processing unit."*

and responsive to the prefetch indicator being associated with the instruction, selectively prefetching data into the cache in the processor (col. 6, lines 53-55; Fig. 2, elements 21 and 22).

Matsubara does not expressly disclose a pointer to a data structure identified by the prefetch indicator.

Anon discloses a pointer to a data structure identified by the prefetch indicator (General Description, 1<sup>st</sup> paragraph and 4<sup>th</sup> paragraph; Detailed Description, 1<sup>st</sup> paragraph). *It should be noted that the "dynamic prefetch pointer" is analogous to the "pointer to a data structure."*

Matsubara and Anon are analogous art because they are from the same field of endeavor, that being prefetching memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to implement Anon's dynamic prefetch pointer within Matsubara's information processing system.

The motivation for doing so would have been to improve memory access due to improved memory access prediction and also improve performance due to reducing the

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time spent waiting for memory accesses to complete (Anon, General Description, 5<sup>th</sup> paragraph).

Therefore, it would have been obvious to combine Matsubara and Anon for the benefit of obtaining the invention as specified in claims 1 and 18.

14. **As per claims 2 and 19**, the combination of Matsubara/Anon discloses the prefetch indicator contains the pointer to the data structure (Anon, General Description, 4<sup>th</sup> paragraph).

15. **As per claims 5 and 22**, the combination of Matsubara/Anon discloses the processor unit is selected from one of an instruction cache, data cache, or a load/store unit (Matsubara, col. 6, lines 35-42; col. 7, lines 10-20; Fig. 2, element 21). *It should be noted that the "CPU 21" is analogous to a "load/store unit."*

16. **As per claims 7 and 24**, the combination of Matsubara/Anon discloses the cache is a data cache (Matsubara, col. 8, lines 56-63).

17. **As per claim 8**, Matsubara discloses a data processing system comprising:  
a cache in a processor in the data processing system (Fig. 2, elements 21 and 22);

and a load/store unit in the processor, wherein the load/store unit determines whether a prefetch indicator is associated with an instruction in response to loading the instruction for execution into the cache, the load/store unit selectively prefetches data into the cache using metadata associated with the instruction (col. 5, lines 1-10; col. 6, lines 35-42 and 53-55; col. 7, lines 10-20; Fig. 1; Fig. 2, elements 21 and 22). *It should be noted that the "indication bits (i.e. PF bits)" are analogous to the "prefetch indicator"*



*as well as the "metadata."*

Matsubara does not expressly disclose a pointer to a data structure identified by the prefetch indicator.

Anon discloses a pointer to a data structure identified by the prefetch indicator (General Description, 1<sup>st</sup> paragraph and 4<sup>th</sup> paragraph; Detailed Description, 1<sup>st</sup> paragraph). *See the citation note for the similar limitation in claims 1 and 18 above.*

Matsubara and Anon are analogous art because they are from the same field of endeavor, that being prefetching memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to implement Anon's dynamic prefetch pointer within Matsubara's information processing system.

The motivation for doing so would have been to improve memory access due to improved memory access prediction and also improve performance due to reducing the time spent waiting for memory accesses to complete (Anon, General Description, 5<sup>th</sup> paragraph).

Therefore, it would have been obvious to combine Matsubara and Anon for the benefit of obtaining the invention as specified in claim 8.

18. **As per claim 9**, the combination of Matsubara/Anon discloses the cache is at least one of an instruction cache and a data cache (Matsubara, col. 8, lines 56-63). *It should be noted that Matsubara discloses the cache is a data cache.*

19. **As per claim 10**, Matsubara discloses the load/store unit selectively prefetches data based on a determination by the cache as to whether the prefetch is to occur (col.

7, lines 18-32). *It should be noted that the prefetch occurs based on whether there is a "hit" or "miss" in the secondary cache.*

Matsubara does not expressly disclose a pointer to a data structure.

Anon discloses a pointer to a data structure (General Description, 1<sup>st</sup> paragraph; Detailed Description, 1<sup>st</sup> paragraph).

Please see the 103 rejection of claim 8 above for the reasons to combine Matsubara and Anon.

20. **As per claim 11**, Matsubara discloses a data processing system for providing hardware assistance to prefetch data during execution of code by a process or in the data processing system, the data processing system comprising:

determining means, responsive to loading an instruction in the code into a cache, for determining, by the a processor unit, whether a prefetch indicator is associated with the instruction (col. 5, lines 1-10; col. 6, lines 35-42; col. 7, lines 10-20; Fig. 1; Fig. 2, elements 21 and 22); *It should be noted that pg. 13, lines 3-5 of Applicant's specification appear to define this means as a computer. Also, see the citation note for the similar limitation in claims 1 and 18 above.*

and selectively prefetching means, responsive to the prefetch indicator being associated with the instruction, for selectively prefetching data into the cache in the processor (col. 6, lines 53-55; Fig. 2, elements 21 and 22). *It should be noted that pg. 13, lines 3-5 of Applicant's specification appear to define this means as a computer.*

Matsubara does not expressly disclose a pointer to a data structure identified by the prefetch indicator.

Anon discloses a pointer to a data structure identified by the prefetch indicator (General Description, 1<sup>st</sup> paragraph and 4<sup>th</sup> paragraph; Detailed Description, 1<sup>st</sup> paragraph). *See the citation note for the similar limitation in claims 1 and 18 above.*

Matsubara and Anon are analogous art because they are from the same field of endeavor, that being prefetching memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to implement Anon's dynamic prefetch pointer within Matsubara's information processing system.

The motivation for doing so would have been to improve memory access due to improved memory access prediction and also improve performance due to reducing the time spent waiting for memory accesses to complete (Anon, General Description, 5<sup>th</sup> paragraph).

Therefore, it would have been obvious to combine Matsubara and Anon for the benefit of obtaining the invention as specified in claim 11.

21. **As per claim 12**, the combination of Matsubara/Anon discloses the prefetch indicator contains the pointer to the data structure (Anon, General Description, 4<sup>th</sup> paragraph).

22. **As per claim 15**, the combination of Matsubara/Anon discloses the processor unit is selected from one of an instruction cache, data cache, or a load/store unit (Matsubara, col. 6, lines 35-42; col. 7, lines 10-20; Fig. 2, element 21). *See the citation note for claims 5 and 22 above.*

23. **As per claim 17**, the combination of Matsubara/Anon discloses the cache is a

data cache (Matsubara, col. 8, lines 56-63).

**24. Claims 3, 13, and 20 are rejected under 35 U.S.C. 103(a) as being obvious over Matsubara in view of Anon as applied to claims 1 and 11 above, and in further view of IBM Technical Disclosure, "Cache Miss Director – A Means of Prefetching Cache Missed Lines," hereafter "IBMTD."**

**25. As per claims 3 and 20, the combination of Matsubara/Anon discloses all the limitations of claims 3 and 20 except determining whether outstanding cache misses are present;**

and prefetching the data if a number of outstanding cache misses are less than a threshold.

IBMTD discloses determining whether outstanding cache misses are present (Discourse Text, lines 13-14); *It should be noted that the "demand miss" is analogous to the "cache miss."*

and prefetching the data if a number of outstanding cache misses are less than a threshold (Discourse Text, lines 14-17). *It should be noted that this limitation contains language that suggests or makes optional but does not require steps to be performed or does not limit the claim to a particular structure and therefore does not limit the scope of a claim. Thus, simply "prefetching the data" is disclosed because the optionally recited parts of this limitation are not required to be taught by the Office. See MPEP §2106, Section II(C)). It should also be noted that "anticipatory cache misses" are analogous to "prefetching data."*

The combination of Matsubara/Anon and IBMTD are analogous art because they

are from the same field of endeavor, that being prefetching memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to implement IBMTD's Cache Miss Directory (CMD) within Matsubara/Anon's information processing system.

The motivation for doing so would have been to get the lines into the cache before a demand miss occurs for them, thus, reducing processing delays (IBMTD, Discourse Text, lines 2-3 and 19-20).

Therefore, it would have been obvious to combine Matsubara, Anon, and IBMTD for the benefit of obtaining the invention as specified in claims 3 and 20.

26. **As per claim 13**, the combination of Matsubara/Anon/IBMTD discloses means for determining whether outstanding cache misses are present (IBMTD, Discourse Text, lines 13-14); *It should be noted that pg. 13, lines 3-5 of Applicant's specification appear to define this means as a computer. Also, see the citation note for the similar limitation in claims 3 and 20 above.*

and means for prefetching the data if a number of outstanding cache misses are less than a threshold (IBMTD, Discourse Text, lines 14-17). *It should be noted that pg. 13, lines 3-5 of Applicant's specification appear to define this means as a computer. Also, see the citation note for the similar limitation in claims 3 and 20 above.*

27. **Claims 4, 6, 16, 21, and 23** are rejected under 35 U.S.C. 103(a) as being obvious over Matsubara in view of Anon as applied to claims 1 and 11 above, and in further view of Malik (U.S. Patent 6,687,794).

28. **As per claims 4 and 21**, the combination of Matsubara/Anon discloses all the

limitations of claims 4 and 21 except determining whether to replace cache lines;

and prefetching the data if a number of cache lines chosen to be replaced are greater than a threshold.

Malik discloses determining whether to replace cache lines (col. 4, lines 60-63);

and prefetching the data if a number of cache lines chosen to be replaced are greater than a threshold (col. 5, lines 16-19). *It should be noted that this limitation contains language that suggests or makes optional but does not require steps to be performed or does not limit the claim to a particular structure and therefore does not limit the scope of a claim. Thus, simply "prefetching the data" is disclosed because the optionally recited parts of this limitation are not required to be taught by the Office. See MPEP §2106, Section II(C)).*

The combination of Matsubara/Anon and Malik are analogous art because they are from the same field of endeavor, that being prefetching memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to implement Malik's prediction history within Matsubara/Anon's information processing system.

The motivation for doing so would have been to provide a technique to increase the performance of the data cache by reducing the possibility of a data cache miss (Malik, col. 4, lines 53-55).

Therefore, it would have been obvious to combine Matsubara, Anon, and Malik for the benefit of obtaining the invention as specified in claims 4 and 21.

29. **As per claims 6 and 23**, the combination of Matsubara/Anon/Malik discloses the

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cache is an instruction cache (Malik, col. 4, lines 10-12; Fig. 3, elements 300 and 310).

30. **As per claim 14**, the combination of Matsubara/Anon/Malik discloses means for determining whether to replace cache lines (col. 4, lines 60-63); *It should be noted that pg. 13, lines 3-5 of Applicant's specification appear to define this means as a computer.*

and means for prefetching the data if a number of cache lines chosen to be replaced are greater than a threshold (col. 5, lines 16-19). *It should be noted that pg. 13, lines 3-5 of Applicant's specification appear to define this means as a computer. Also, see the citation note for the similar limitation in claims 4 and 21 above.*

31. **As per claim 16**, the combination of Matsubara/Anon/Malik discloses the cache is an instruction cache (Malik, col. 4, lines 10-12; Fig. 3, elements 300 and 310).

### **Conclusion**

#### **STATUS OF CLAIMS IN THE APPLICATION**

The following is a summary of the treatment and status of all claims in the application as recommended by MPEP 707.70(i):

#### **CLAIMS REJECTED IN THE APPLICATION**

Per the instant office action, **claims 1-24** have received a first action on the merits and are subject of a first action non-final.

#### **RELEVANT ART CITED BY THE EXAMINER**

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The following prior art made of record and not relied upon is cited to establish the level of skill in Applicant's art and those arts considered reasonably pertinent to Applicant's disclosure. See MPEP 707.05(e).

1. U.S. Patent 6,539,458 (Holmberg) discloses hierarchical memory for efficient data exchange control.
2. U.S. Patent 6,973,542 (Schmuck et al.) discloses detecting when to prefetch inodes and then prefetching inodes in parallel.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arpan P. Savla whose telephone number is (571) 272-1077. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sanjiv Shah can be reached on (571) 272-4098. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Arpan Savla  
Art Unit 2185  
September 18, 2006



SANJIV SHAH  
PRIMARY EXAMINER